

10/541398  
JC14 Rec'd PCT/PTO 01 JUL 2005

Title: star-shaped conveyor for feeding or discharge empty plastics containers or bottles to or from a machine and orienting and aligning machine having said star-shaped conveyor

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## D E S C R I P T I O N

The present invention relates to a star-shaped conveyor for feeding or discharging empty plastics containers or bottles to or from a machine and an aligning and orienting machine comprising said star-shaped conveyor.

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A star-shaped conveyor is a conveyor comprising a disk rotating around its vertical axis, a plurality of regularly or not regularly spaced apart recesses or indentations are formed in its periphery, these indentations or recesses are adapted to receive and transfer empty bottles to a machine and from a bottle processing machine, e.g. a rinsing machine or an orienting and aligning machine

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The star-shaped conveyor which supplies/takes bottles to/from the bottle processing machine, must be perfectly synchronized with the same machine in order to avoid jamming.

According to the present needs, all of the empty bottle processing machines must process bottles of

different shapes or bottles having the same shape but different capacity.

As the shape is changed, the prior art star-shaped conveyors must be subjected to complex mechanical  
5 modifications, and sometimes it is even necessary to change also the shape and the pitch of the recesses defined in the star-shaped conveyor.

Extremely complicate star-shaped conveyors having changeable indentations are known, which require  
10 time-consuming adjustments and consequently long downtimes whenever the bottle size is changed.

The object of the present invention is to implement a star-shaped conveyor designed to transport bottles of varying sizes or capacities without changing the  
15 recess shape.

Another object is to simplify the operation of discharging the empty bottles even the deformed ones. These and other objects will be achieved by a star-shaped conveyor for feeding or discharging empty  
20 plastics containers or bottles to or from a machine and an orienting and aligning machine including said star-shaped conveyor, object of the present invention, which are characterized by the attached claims.

These and other characteristics will be better understood by the following description, given only in a non limiting illustrative way, of a preferred embodiment shown in the attached drawings, wherein:

- 5- Fig. 1 is a perspective view of the star-shaped conveyor partially sectioned to show some details,
- Fig. 2 is a perspective view of a sucking apparatus mounted to the star-shaped conveyor,
  - Fig. 3 is a perspective view of a vacuum source
- 10 located under the star-shaped conveyor,
- Fig. 4 is a perspective view of the star-shaped conveyor mounted to a machine for orienting and aligning empty plastics bottles,

Referring to Fig. 1, reference number 1 generally

15 shows a star-shaped conveyor formed by two circular plates 2, 3, defining along their peripheries indentations or recesses 4 adapted to receive bottles 6 coming, in the example shown, from a machine 5 for orienting and aligning empty plastics bottles 6.

20 The bottles exiting said machine are transferred on a mechanical or pneumatic conveyor 7 which transports them to a filling apparatus.

Box elements 8 are sandwiched the two plates 2, 3. Each box-element has a face 10 shaped to perfectly

follow the curvilinear outline of the recesses 4 and formed in dependence on the biggest bottles. A vertical opening 9 is defined in each face 10.

The lower face of each box element 8 is opened and  
**5** abuts the lower plate 2 in correspondence of horizontal openings 11.

Openings 11 are defined along a circumference and overlap an underlying slot 12 defined in a surface 13 of a cylindrical chamber 14 in which there is a  
**10** negative pressure.

Slot 12 span an arc varying from 90° to 180°.

The cylindrical chamber 14 is connected by a tube 15 to a fan 16 which sucks air from said chamber in order to establish said negative pressure.

**15** The vertical opening or slot 9 of each box element 8 must have a width that assures a contact with a bottle having the lowest diameter that the star-shaped conveyor can process, in this way it is possible to process every bottle having a greater  
**20** diameter obviously up to the maximum limit determined by the recess depth and cross-section. The star-shaped conveyor is rotatively driven by known and not illustrated driving means which are independent or connected to a machine which the

conveyor is connected to.

The operation of the star-shaped conveyor will follow,

All of the box elements located on the slot 12 are  
5 connected to the cylindrical chamber 14 from which  
air is sucked by the fan, in this way every container  
which will come in front of the above mentioned slots  
will be sucked and hold in the recess until the box  
element will depart from the slot 12.

10 In the shown example, the bottles will be held for a  
180° arc, anyway by extending or shortening the arc  
it will be possible to change the bottle discharge  
position with respect to the take up position.

To this end, it is provided a sliding door (not  
15 shown) to reduce the working arc of said slot and  
consequently change the angular discharge position.

In addition, the star-shaped conveyor is also rotated  
around its vertical axis by driving means which are  
not expressly described and shown, said driving means  
20 can be independent or dependent on the machine for  
introducing or taking bottles which the conveyor is  
connected to.

As it is shown in Figures 2, 3 and 4, the star-shaped  
conveyor can be preferably but not exclusively

applied in a machine for orienting and aligning bulk bottles received in a cylindrical container of said machine.

As a matter of fact, the latest models of said  
5 machines must be capable to process different types of containers particularly of different capacity such as the mineral water filling apparatus which must process bottles of half liter to two liters.

Said machines, such as the machine described in the  
10 Italian patent N. 1287097, are provided with two or more discharge locations for increasing their productivity and require a carousel 20 carrying a plurality of spacers 21 forming a number of channels which is multiple of a number of the funnel discharge  
15 channels minus one.

The discharge channel, not shown, are located above the spacers and they are carried by a cylindrical wall which rotates around a vertical axis at a speed different from that of the carousel 20 carrying the  
20 spacers.

Therefore it is necessary a star-shaped conveyor for picking up the bottles from the spacers and transporting them along a predetermined direction; by means of two star-shaped conveyors and keeping

unchanged the rotation direction of the aligning machine, it is possible to feed bottles along a direction opposite to that shown in figures.

Applying the star-shaped conveyor which holds bottles  
5 by a negative pressure attached to an aligning machine it is possible to obtain several advantages, among them:

- the shape of the spacers and/or discharge channels is simplified.
- 10- It is possible to get rid off a bottle sliding surface because bottles travel hanging and held by their bodies.
- It is possible to get rid off the devices for extracting defective and crushed bottles.
- 15 The above described star-shaped conveyor can be applied at the exit of a rinsing machine, wherein an incorrect synchronization of the star-shaped conveyor with the machine can break the bottles.

For making easier the insertion of the bottles by the  
20 pneumatic conveyor 7 according to bottle size change, the conveyor can be provided with means for rising or lowering it, or the star-shaped conveyor, which can have and independent driving means or dependent on the machine which is connected to, must be capable of

moving vertically.

The star-shaped conveyor can be rotated by driving a slotted shaft which, in turn, rotates a sleeve coupled to said slotted shaft, which in turn rotates  
**5** said star-shaped conveyor.

The cylindrical stationary chamber must also obviously follow the vertical motion of the star-shaped conveyor.



## C L A I M S

1. Star-shaped conveyor for transporting or taking out empty plastics containers or bottles to or from a machine of a type comprising a plurality of indentations (4) uniformly distributed along the periphery of two spaced apart plates (2 and 3), characterized by the fact vacuum is provided in each indentation capable of holding the empty bottle tightly against the indentation surface for a predetermined circumferential arc.
2. Star-shaped conveyor according to claim 1 characterized by the fact each indentation is provided with a box element supported by the lower plate (2) defining openings (11), the number of openings (11) being equal to the number of indentations, openings (11) are arranged along a circumference overlaying a slot (12) defined on a cylindrical chamber (14) in which vacuum is created, each box element has a vertical opening (9) made in one (10) of its faces which follows the curvilinear profile of the indentation.
3. Star-shaped conveyor according to the preceding claims, characterized by the fact the slot (12) extends along an arc comprised between  $90^{\circ}$  and  $180^{\circ}$

starting from the discharge of an operative machine to the inlet of a conveyor for transporting bottles.

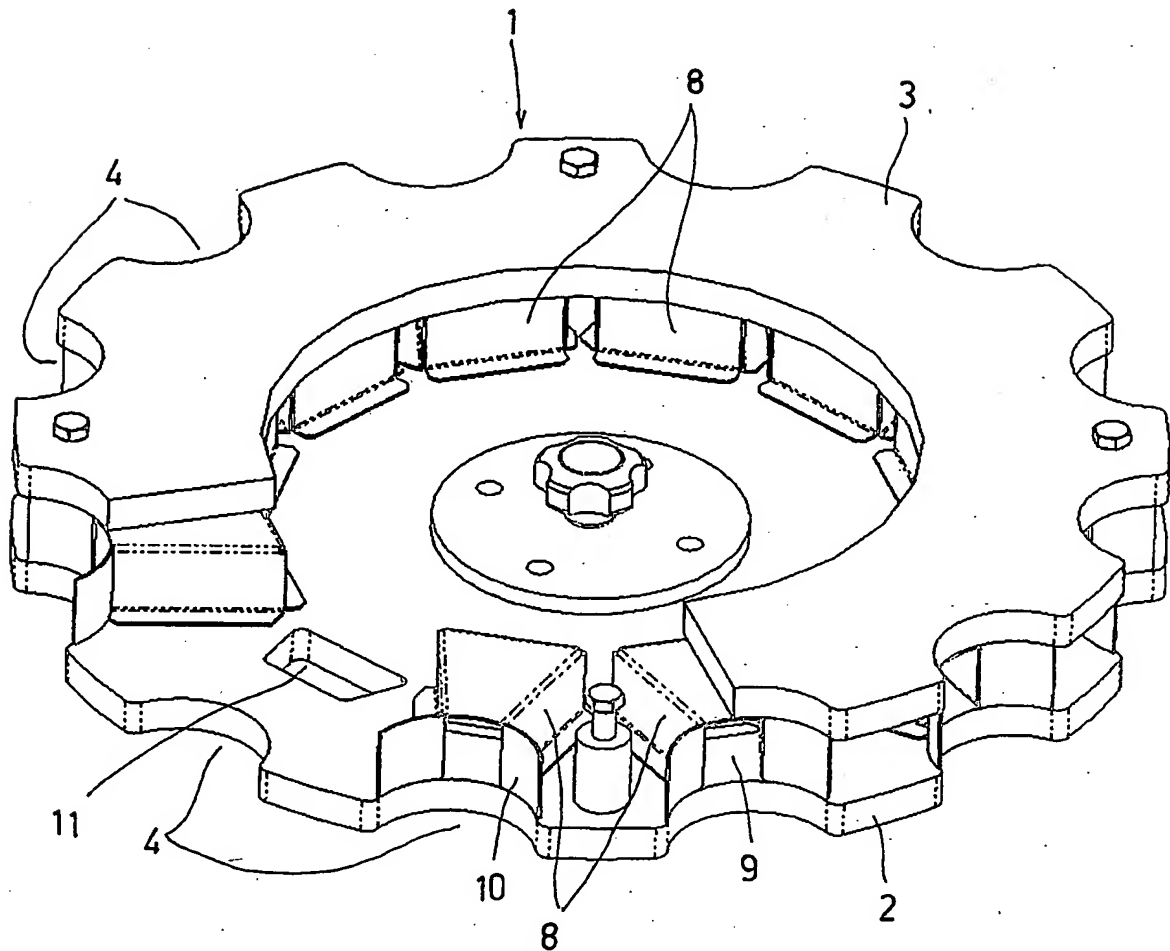
4. Machine for aligning and orienting plastics bottles of a type comprising a star-shaped conveyor  
5 located at the discharge for taking out the bottles and provided with a plurality of indentations uniformly arranged along the periphery of two spaced apart plates, characterized by the fact vacuum is provided in each indentation capable of holding and  
10 transporting the empty bottle tightly against the indentation surface for a predetermined circumferential arc.

5. Machine according to claim 4, characterized by the fact that the star-shaped conveyor is driven by the  
15 same driving means of the aligning and orienting machine.

6. Machine according to claim 4, characterized by the fact the star-shaped conveyor has its own driving means independent from the machine driving means.

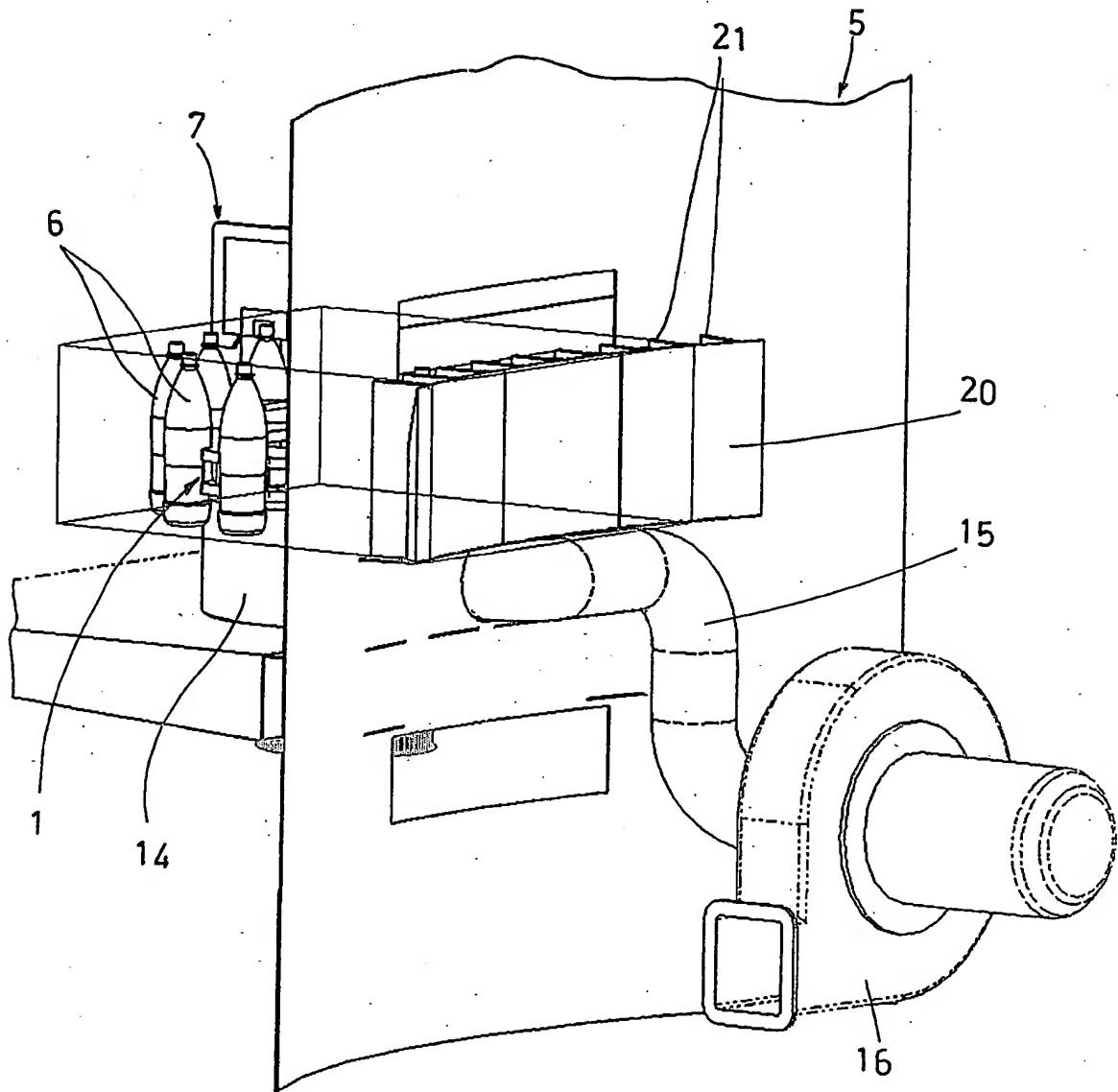
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FIG.1



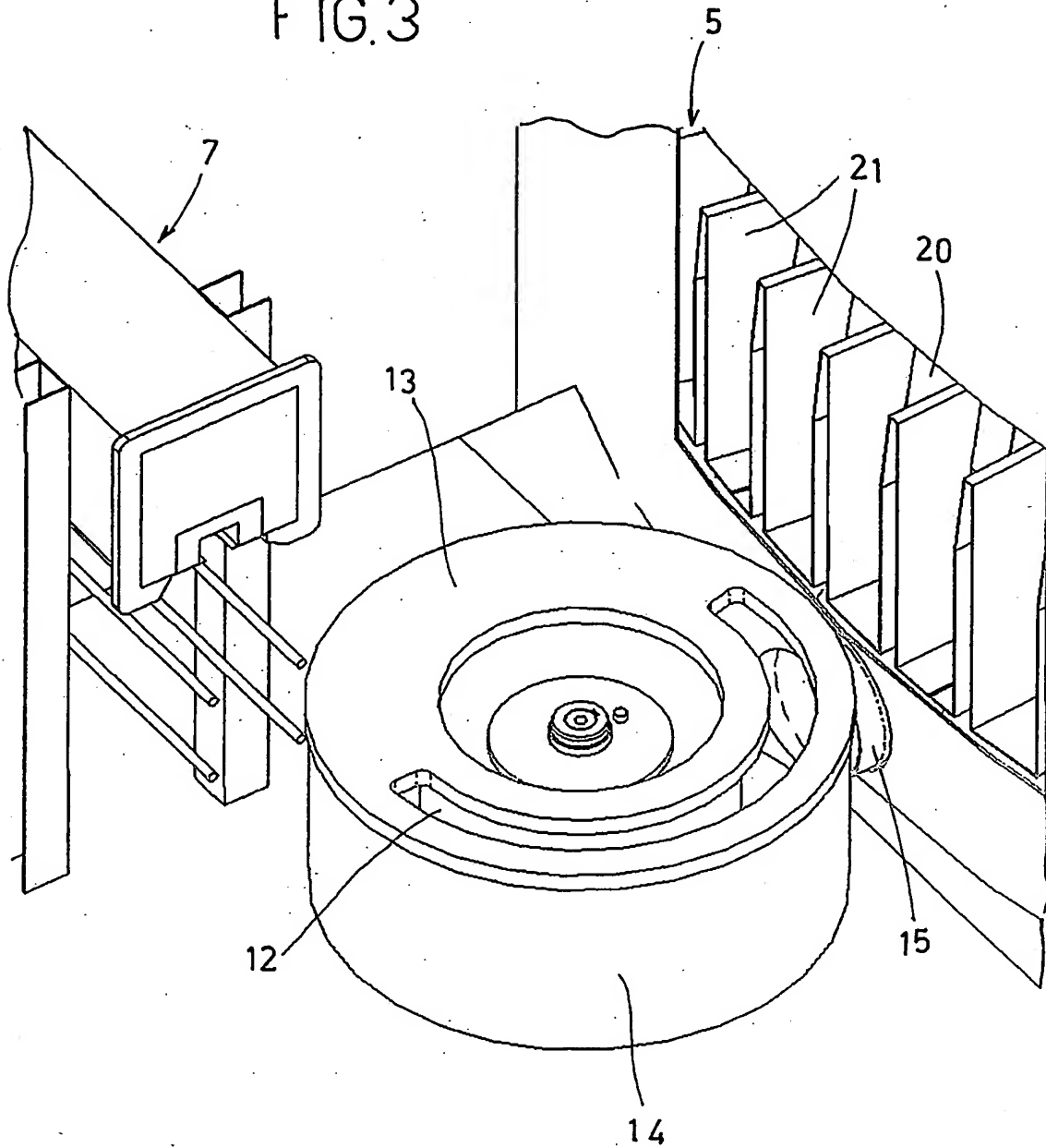
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FIG.2



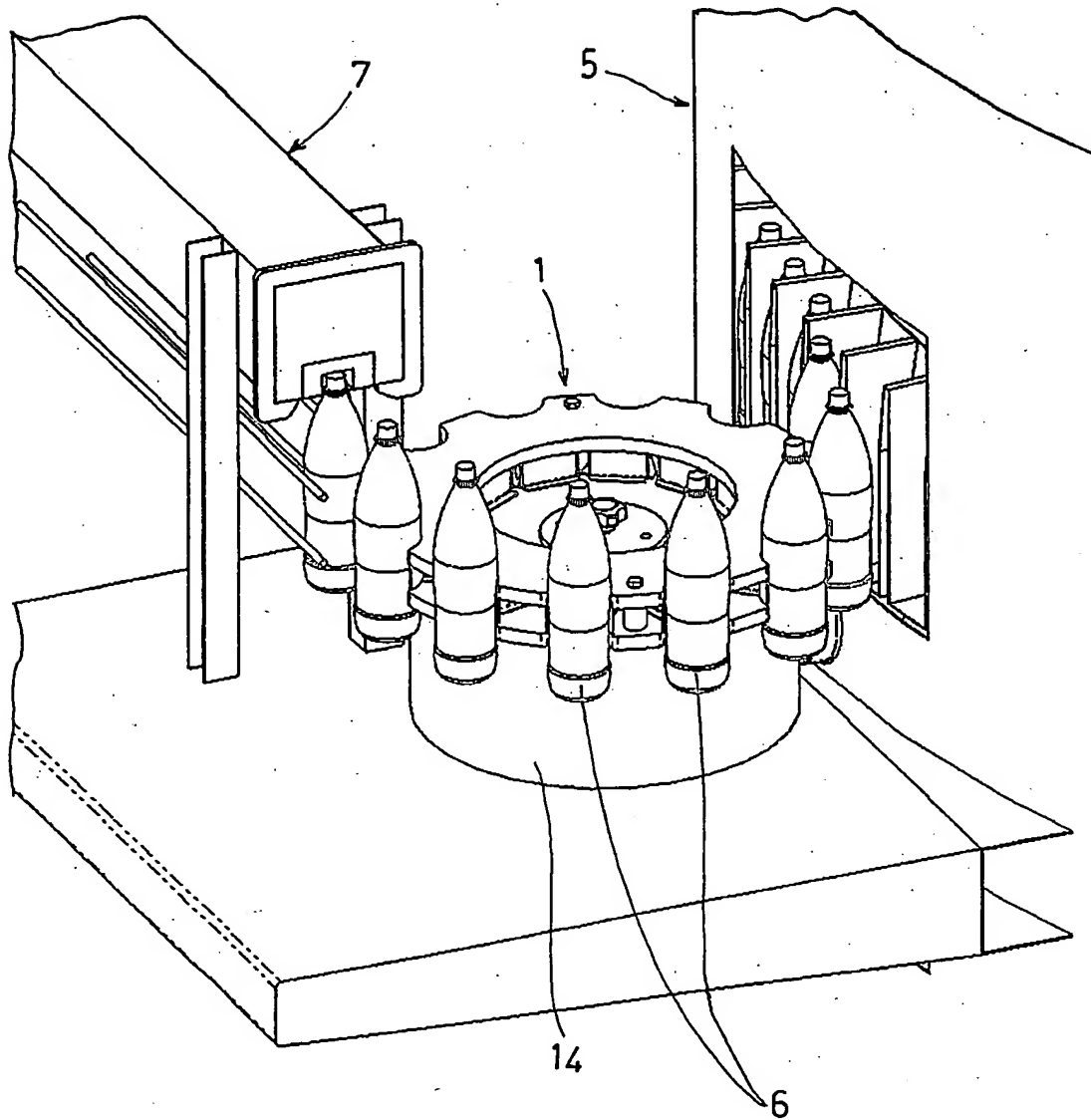
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FIG. 3



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FIG. 4



## INTERNATIONAL SEARCH REPORT

 International Application No  
 PCT/EP2004/000508

 A. CLASSIFICATION OF SUBJECT MATTER  
 IPC 7 B65G47/84 B65G47/14

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

 Minimum documentation searched (classification system followed by classification symbols)  
 IPC 7 B65G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 0080, no. 09 (M-268), 14 January 1984 (1984-01-14) & JP 58 172109 A (MITSUBISHI DENKI KK), 8 October 1983 (1983-10-08) abstract; figures 1-4	1
Y		4,5
A		2,3
A	DE 40 10 601 C (HERLAN & CO MASCHINENFABRIK GMBH) 24 October 1991 (1991-10-24) the whole document ----- -/--	1-3

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

## \* Special categories of cited documents:

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
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- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*G\* document member of the same patent family

Date of the actual completion of the international search

26 July 2004

Date of mailing of the international search report

05.08.2004

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# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/EP2004/000508

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 6 098 781 A (LANFRANCHI LINO) 8 August 2000 (2000-08-08) column 2, line 39 - line 46 column 2, line 59 - line 62 figure 1	4,5
Y	----- EP 1 209 103 A (PROMEC S R L) 29 May 2002 (2002-05-29) paragraph '0042!; figure 1	4,5
Y	----- EP 1 142 807 A (RONCHI MARIO S R L) 10 October 2001 (2001-10-10) paragraph '0013!; figures 1,2	4
A	-----	5,6



# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/EP2004/000508

## Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ No protest accompanied the payment of additional search fees.

**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-3

A star-shaped conveyor.  
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2. claims: 4-6

A machine for aligning and orienting plastic bottles with a star-shaped conveyor.  
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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

I EP2004/000508

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
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